

# INFLATABLE ABDOMINAL EXERCISE APPARATUS

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to exercise devices and methods for isolating, strengthening, and toning the abdominal and lower back muscles.

### 2. State of the Art

Sit-ups are used by many to strengthen and tone the abdominal muscles.

Typically, the sit-up is executed by placing one's back to floor with the knees bent and feet flat to the floor. The hands are placed behind the head with the elbows extending forward. The head and shoulders are lifted using the abdominal muscles until the elbows touch the knees, and then the head and shoulders are lowered back to the floor.

When the sit-up is performed on a flat surface, the hip-flexor muscles provide assistance the abdominal muscles and thus take away some of benefits to the abdominal muscles. To alleviate this problem, exercise cushions have been developed and sold commercially, such as that sold under the AB-MAXIMIZER name. These cushions are placed under the lower back and provide improved isolation of the abdominal muscles during the sit-up by eliminating assistance from the hip-flexor muscles.



1           It is also an object of the invention to provide such an exercise apparatus that  
2 enables control over range of motion and effort such that it is suitable for different users.

3

4           In accord with these objects, which will be discussed in detail below, an improved  
5 abdominal exercise apparatus is provided with a seat operably disposed on a base. The  
6 base has an inflatable back wedge section and optionally an independently inflatable front  
7 wedge section. The seat has raised sides that form a shallow cavity that is adapted to  
8 support the body of a user therein. The seat resiliently flexes forward and backward  
9 along its length. At least one inflatable cushion, which is preferably profiled to accept  
10 the body contour of the user, provides a floor below the shallow cavity. A first set of  
11 hand grips are affixed to opposite sides of a top portion of the seat. A second set of hand  
12 grips are affixed to opposite sides of a bottom portion of the seat.

13

14           It will be appreciated that a wide variety of effective abdominal exercise and other  
15 exercises can be performed with the apparatus while stress to the lower back and neck are  
16 reduced.

17

18           According to one embodiment of the invention, the inflation level of the back  
19 wedge section is adjustable to vary the range of motion of the user's body (and thereby  
20 control the amount of lower back strain).

21

22           According to another embodiment of the invention, the inflation level of the front  
23 wedge section is adjustable to vary the range of motion of the user's body.

1

2           According to a further embodiment of the invention, the floor below the shallow  
3 cavity is realized by three independently inflatable cushions including a first cushion  
4 disposed under the upper legs of the user during use, a second cushion disposed under the  
5 lumbar section of the user during use, and a third cushion disposed under the upper torso,  
6 neck and head of the user during use. The second (lumbar) air cushion supports the  
7 lower back and also reduces lower back strain. The third air cushion supports the head  
8 and neck to reduce lower neck strain.

9

10           Additional objects and advantages of the invention will become apparent to those  
11 skilled in the art upon reference to the detailed description taken in conjunction with the  
12 provided figures.

13

#### 14                           BRIEF DESCRIPTION OF THE DRAWINGS

15

16           Fig. 1 is an isometric view of an abdominal exercise apparatus according to the  
17 present invention;

18

19           Fig. 2 is side view of the abdominal exercise apparatus of Fig. 1, supporting a  
20 user's body in use;

21

1            Fig. 3 is a side view of the abdominal exercise apparatus of Fig. 1, showing the  
2            starting inclination angle of the body of the user as controlled by the level of inflation of  
3            the back wedge section of the base portion;

4  
5            Fig. 4A is a top view of the seat portion of the abdominal exercise apparatus of  
6            Figs. 1 through 3; and

7  
8            Fig. 4B is a side view of the seat section and base section of the abdominal  
9            exercise apparatus of Figs. 1 through 3.

10  
11           Fig. 5 is a side view of the seat section and base section of an alternate abdominal  
12           exercise apparatus in accordance with the present invention.

13  
14           Fig. 6A is an isometric view of the seat section and base section of the abdominal  
15           exercise apparatus of Fig. 5, showing hook and loop fastener straps that removably attach  
16           the base section to the seat section.

17  
18           Fig. 6B is an isometric view of the seat section and base section of the abdominal  
19           exercise apparatus of Fig. 5, showing the base section removably attached to the seat  
20           section with hook and loop fastener straps.

21  
22           Figs. 7A and 7B are side views of the seat section and base section of the  
23           abdominal exercise apparatus of Fig. 5 during conventional sit-up exercise.

1

2 Figs. 8A, 8B and 8C are side views of the abdominal exercise apparatus of Fig. 5,  
3 showing different configurations of the inflatable back wedge section for different levels  
4 of effort (from the easiest level of effort to the hardest level of effort).

5

## 6 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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8 Turning now to Figs. 1 and 2, there is shown an abdominal exercise apparatus 10  
9 in accordance with the present invention. It includes a seat portion 12 that is centrally  
10 disposed on and attached (preferably by hook and loop fastener(s)) or affixed to a base  
11 portion 14. The base portion 14 includes an inflatable front wedge section 16 and an  
12 inflatable back wedge section 18. Preferably, the inflatable chambers (not shown) within  
13 the front wedge section 18 and the back wedge section 18 have their own air valve  
14 assemblies (not shown) and thus are independently inflatable. The seat portion 12 has an  
15 outer support structure 20 that maintains a C-shape profile (or shape similar thereto)  
16 when viewed from the side as best shown in FIG. 2 in order to support the user's body.  
17 The outer support structure 20 is preferably realized by two sections 21A, 21B that are  
18 interconnected by a hinge 22 (such as a live hinge) that enables the top section 21A to  
19 flex downward toward the bottom section 21B during use. The hinge 22 may be adapted  
20 to provide resistance to such flexing movement if desired. Such resistance increases the  
21 energy applied to the abdominal muscles during use. The outer support structure 20 has  
22 raised sidewalls 28 that form a shallow central cavity 30 therebetween. Preferably, the  
23 shape and form of the outer support structure 20 is resiliently retained by heat sealed

1 vinyl internal ribs or other support structure s (not shown). Two inflatable support  
2 cushions 32A, 32B provide a floor below the central cavity 30. The user's body (from the  
3 upper legs to head) is disposed within this shallow central cavity 30 during use and thus  
4 centralized on the apparatus. Preferably, three inflatable chambers 33A, 33B, 33B within  
5 the two support cushions 32A, 32B have their own air valve assemblies (not shown) and  
6 thus are independently inflatable. As shown in Fig. 2, the support cushion 32A and the  
7 inflatable chamber 33A support the upper legs of the user, the support cushion 32B and  
8 the inflatable chamber 33B support the lumbar region of the user, and the support cushion  
9 32B and the inflatable chamber 33C support the upper back, neck and head of the user.  
10 Preferably, the upper surface of the support cushions 32A, 32B are contoured to fit the  
11 body of the user as shown. Moreover, the upper surface of the support cushion 32B  
12 optimally forms a spinal cavity 34 that fits around the backbone of the user and a head  
13 cavity 35 that fits around the head of the user. The spinal cavity 34 and the head cavity  
14 35 provide improved support of the back and neck, respectively.

15  
16 A first pair of hand straps 36A, 36B are affixed to opposite sides of the upper  
17 portion 24 of the outer support structure 20. The upper hands straps 36A, 36B are  
18 preferably positioned to provide a natural hand position that encourages positioning the  
19 user's hands adjacent his/her head. The upper-hand straps 36A, 36B can be used to  
20 exercise the abdominal muscles as described below. A second pair of hand straps 38A,  
21 38B are affixed to opposite sides of the lower portion 26 of the outer support structure 20.  
22 The lower hand straps 38A, 38B are preferably positioned to provide a comfortable way  
23 for the user to position himself/herself on the apparatus. The lower hand straps 38A, 38B

1 can also be used to exercise the upper abdominal muscles and oblique muscles as  
2 described below. Preferably, the upper and lower hand straps are formed from nylon  
3 webbing that are stitched or heat sealed to the support structure 20 to provide reliable and  
4 low-cost manufacturing.

5

6 As described above, the inflatable chambers of the apparatus are provided with air  
7 valves. The air valves can be mouth valves, needle valves, pump valves or any other type  
8 of air valves known in the art. Preferably, the air valves are adapted to permit the  
9 respective air chambers to be rapidly emptied of air. An air pump (not shown), which is  
10 preferably packaged along with apparatus 10, mates to the air valves to inflate the  
11 respective chambers. The air pump can be a manually-actuated air pump (e.g., a foot  
12 pump or hand-pump) or an electric air pump.

13

14 The support cushions 32A, 32B of the seat 12 and the wedge sections 16, 18 of  
15 the base 14 are preferably realized from plastic, such as vinyl or heavy gauge PVC, that is  
16 welded together (preferably using well-known heat welding or ultrasonic welding  
17 techniques) to provide the air-tight chambers therein. The seat 12 and the base 14 are  
18 preferably formed from ribs, channel, columns or other inflatable support structures that  
19 provide rigidity to retain their desired shape and structure. The outer surface of the seat  
20 12 and base 14 preferably has flocking (or double-flocking) to provide a soft  
21 intermediary between the user and the plastic. Such flocking also aids against scooting of  
22 the apparatus on the floor (e.g., carpet). Sewn nylon or another suitable bag may also be  
23 used for the inflatable structures. Preferably, the outer support structure 20 is realized



1 with inlay cotton. An outer sock (not shown) that slips over the seat 12 may be provided.  
2 The outer sock is preferably formed from a durable resilient material. The outer sock  
3 may have slits that enable the user to insert and remove the inflatable seat cushions 32A,  
4 32B (preferably in a non-inflated state) into place. The outer sock may also have access  
5 flaps (not shown) that provide quick and easy access to the air valves that are used to  
6 inflate the air chambers of the apparatus. In addition, the outer sock (or the outer support  
7 structure of the seat 12) may have a pocket 73 (or other storage compartment) as shown  
8 in Figs. 6A and 6B that can be used to hold electronic devices (such as MP3 players, CD  
9 players, etc). Such electronic devices produce audio signals (and possibly video signals)  
10 for supply to the user during exercise.

11  
12 A patch kit (not shown), which is preferably packaged along with apparatus 10,  
13 may be used to repair damage (e.g., holes) to the inflatable chambers of the apparatus.

14  
15 Prior to (or during) exercising, the user can adjust the level of inflation of the  
16 front wedge section 16 and/or the back wedge section 18 of the base 14. The level of  
17 inflation of these sections adjusts the range of motion of the user (and corresponding  
18 level of effort when performing sit-ups through the range of motion). A lower inflation  
19 level provides a larger range of motion than a higher inflation level. For an extreme level  
20 of effort, the back wedge section 18 can be deflated entirely (or detached from seat 12  
21 and not used (Fig. 8C)).

1           Note that by adjusting the inflation level of the back wedge section 18, the user  
2   can control the starting inclination angle  $\alpha$  as shown in Fig. 3. Preferably, the inflation  
3   levels of the back wedge section provide a range of starting inclination angles between  
4   zero and thirty degrees and possibly between zero and forty-five degrees. Note that a  
5   starting inclination angle greater than 8 degrees may be desired. In this configuration,  
6   lower back strain that occurs in body positions at inclination angles between 0 and 8  
7   degree is avoided. Such lower back strain is associated with the majority of sit-up related  
8   injuries as described above. Moreover, neck strain is avoided because the neck and head  
9   are well supported by the seat with the hands held in their natural position by the upper  
10   hand straps.

11  
12           Also note that by adjusting the inflation level of the front wedge section 16, the  
13   user can control his/her leg position. Because the front wedge section 16 pushes the  
14   pelvis back towards the back wedge section 18, adjustment of the inflation level of the  
15   front wedge section 16 enables the user to adjust the position of the pelvis and lower back  
16   against the back wedge section 18 as desired.

17  
18           The apparatus 10 can be used to perform a wide variety of abdominal exercises as  
19   well as other exercises. For example, the user can perform "conventional" sit-up  
20   exercises that target the lower abdominal muscles by positioning his/her body as shown  
21   in Fig. 2, grabbing the upper hand straps with his/her hands with the elbows extending  
22   forward, and then moving the head and shoulders forward (and back) using the  
23   abdominal muscles. The resilient nature of the apparatus 10 works against the lower

1 abdominal muscles during such movement to strengthen and tone the lower abdominal  
2 muscles. The inflation level of the front wedge section 16 and the inflatable chamber  
3 33A of the seat 12 can be varied to adjust the bend angle of the legs for bent-leg sit-ups.  
4 Alternatively, the front wedge section 16 and the inflatable chamber 33A of the seat 12  
5 can be deflated entirely (or removed from the apparatus) for straight-leg sit-ups. For a  
6 lower level of exercise, the user can grip the lower hand straps 38A, 38B instead of the  
7 upper hand straps during the exercise.

8  
9 Similarly, the user can perform "twisting" sit-up exercises that target the lower  
10 abdominal muscles and oblique muscles. In this exercise, the user grabs the upper hand  
11 straps with his/her hands and holds the head rest of the seat 12 against the head.  
12 The user twists his/her upper body while moving forward to strengthen and tone the  
13 lower abdominal muscles and oblique muscles. The resilient nature of the apparatus 10  
14 works against the lower abdominal muscles and oblique muscles during such twisting  
15 movement to strengthen and tone these muscles. The inflation level of the front wedge  
16 section 16 and the inflatable chamber 33A of the seat 12 can be varied to adjust the bend  
17 angle of the legs for bent-leg twisting sit-ups. Alternatively, the front wedge section 16  
18 and the inflatable chamber 33A of the seat 12 can be deflated entirely (or removed from  
19 the apparatus) for straight-leg twisting sit-ups. For a lower level of exercise, the user can  
20 grip the lower hand straps 38A, 38B instead of the upper hand straps during the exercise.

21  
22 The upper abdominal muscles may be exercised by positioning the base 14 of the  
23 apparatus 10 on an elevated surface (such as the seat of a reclining chair). The user

1 positions his/her body as shown in Fig. 2, grabs the lower hand straps with his/her hands  
2 with the elbows extending forward, and then moves the head and shoulders backward  
3 (and forward) using the upper abdominal muscles. The resilient nature of the apparatus  
4 10 works against the upper abdominal muscles during such movement to strengthen and  
5 tone the upper abdominal muscles.

6  
7 In addition, the apparatus 10 can be used to perform side leg lifts and oblique  
8 strengthening. In these exercises, the front and back wedge sections 16, 18 are deflated  
9 and the user lies on his/her side in the seat portion 12. In effect, the seat portion 12 is  
10 used as an inflated exercise mat with raised sidewalls that keep the user centered on the  
11 mat during exercise. When performing the side leg lifts and/or oblique muscle exercises,  
12 the user can grasp onto one of the lower hand straps for support.

13  
14 Advantageously, the back wedge section 18 and/or the inflatable support cushion  
15 33B provide a soft intermediary between the floor and the upper buttocks/lower back of  
16 the user. It also provides an impact cushion (air cushion 33B) to smooth out the  
17 transition from rocking back to rocking forward, which avoids the jerkiness of the sit-up  
18 which caused injuries in the prior art. It also enables adjustable positioning of the lower  
19 back and aids to isolate the muscle groups in the stomach during exercise (by eliminating  
20 assistance from the hip-flexor muscles). Moreover, the inflation levels of the air  
21 chambers provide control over the hardness of the apparatus, which provides variable  
22 resiliency. Moreover, the inflation levels of the air chambers provide user control over  
23 different levels of exercise (from a low level of exercise to a high level of exercise).

1

2 Figs. 4A and 4B provide general dimensions of the abdominal exercise apparatus  
3 of Figs. 1 and 2. As shown in Fig. 4A, the seat section is on the order of 24 inches wide  
4 and 38 inches long. The raised sidewall is on the order of 2 inches wide. The support  
5 cushions 32A, 32B are on the order of 18 inches wide. As shown in Fig. 4B, with the  
6 back wedge section 18 fully inflated, it has a height on the order of 8 inches. The top  
7 portion of the seat extends to a height on the order of 30 inches, while the bottom portion  
8 of the seat 12 extends to a height on the order of 11.25 inches.

9

10 Fig. 5 illustrates an alternate abdominal exercise apparatus in accordance with the  
11 present invention. In this embodiment, the seat 12' is adapted to include an inflatable  
12 wedge section 51 that is coupled via a living hinge interface 52 to a back rest section 53.  
13 The back rest section 53 is supported by a back wedge section 16'. Both the wedge  
14 section 51 and the back rest section 53 have raised sidewalls (similar to the embodiment  
15 described above) that form a shallow central cavity therebetween. The user's body (from  
16 the upper legs to head) is disposed within this shallow central cavity during use and thus  
17 centralized on the apparatus. As shown, the wedge section 51 supports the upper legs of  
18 the user during use, while the back rest section 53 supports the lumbar section, upper  
19 back, neck and head of the user. The profile of the wedge section 51 and the back rest  
20 section 53 may be contoured to fit the body of the user (and for example, form a spinal  
21 cavity) as described above.

22

1           The apparatus 10' includes three air chambers - a first air chamber 54 that is part  
2 of the wedge section 51, a second air chamber 55 that is part of the back rest section 53  
3 and that is disposed under the lumbar section of the user, and a third air chamber 56 that  
4 is part of the back wedge section 16'. The second air chamber 55 may be extended such  
5 that is disposed under the upper back and possibly the neck and head of the user.  
6 Preferably, the inflation levels of the three air chambers are independently inflatable.

7  
8           The apparatus 10' may include upper hands straps 66 (one shown) and/or lower  
9 hand straps 68 (one shown) similar to those described above. In addition, the apparatus  
10 10' may utilize hook and loop fastener straps 71A, 71B that removably attach the back  
11 wedge section 14' to the wedge section 51 of the seat. As shown in Figs. 6A and 6B, the  
12 fastener straps 71A, 71B preferably wrap under the wedge section 51 and are removably  
13 attached to hook and fastener pads 72A, 72B affixed to the front of the wedge section 51.  
14 In this configuration, the straps 71A, 72B effectively hold the back wedge section 16' in  
15 place adjacent the upper section of the seat as shown.

16  
17           Advantageously, the apparatus 10' can be used to perform the wide variety of  
18 abdominal exercises as well as other exercises. For example, the user can perform  
19 "conventional" sit-up exercises that target the lower abdominal muscles by positioning  
20 his/her body as shown in Fig. 7A, grabbing the upper hand straps 66 with his/her hands  
21 with the elbows extending forward, and then moving the head and shoulders forward (and  
22 back) using the abdominal muscles. The resilient nature of the apparatus 10' works  
23 against the lower abdominal muscles during such movement to strengthen and tone the

1 lower abdominal muscles. The inflation level of the wedge section 51 can be varied to  
2 adjust the bend angle of the legs for bent-leg sit-ups. Alternatively, the inflation level of  
3 the wedge section 51 can be deflated for straight-leg sit-ups. For a lower level of  
4 exercise, the user can grip the lower hand straps 68 instead of the upper hand straps 66  
5 during the exercise.

6

7 Similarly, the user can perform "twisting" sit-up exercises that target the lower  
8 abdominal muscles and oblique muscles. In this exercise, the user grabs the upper hand  
9 straps 66 with his/her hands and holds the head rest of the seat 12' against the head.  
10 The user twists his/her upper body while moving forward to strengthen and tone the  
11 lower abdominal muscles and oblique muscles. The resilient nature of the apparatus 10'  
12 works against the lower abdominal muscles and oblique muscles during such twisting  
13 movement to strengthen and tone these muscles. The inflation level of the wedge section  
14 51 can be varied to adjust the bend angle of the legs for bent-leg twisting sit-ups.  
15 Alternatively, the wedge section 51 can be deflated for straight-leg twisting sit-ups. For a  
16 lower level of exercise, the user can grip the lower hand straps 68 instead of the upper  
17 hand straps 66 during the exercise.

18

19 The upper abdominal muscles may be exercised by positioning the seat 12' of the  
20 apparatus 10' on an elevated surface (such as the seat of a reclining chair). The user grabs  
21 the lower hand straps 68 with his/her hands with the elbows extending forward, and then  
22 moves the head and shoulders backward (and forward) using the upper abdominal

1 muscles. The resilient nature of the apparatus 10' works against the upper abdominal  
2 muscles during such movement to strengthen and tone the upper abdominal muscles.

3  
4 In addition, the apparatus 10' can be used to perform side leg lifts and oblique  
5 muscle strengthening. In these exercises, the back wedge section 16' is detached from the  
6 seat 12' (it is not used) and the wedge section 51 is deflated. The user lies on his/her side  
7 in the seat portion 12'. In effect, the seat portion 12' is used as an inflated exercise mat  
8 with raised sidewalls that keep the user centered on the mat during exercise. When  
9 performing the side leg lifts and/or oblique muscle exercises, the user can grasp onto one  
10 of the lower hand straps for support.

11  
12 The inflation level of the air chambers 54, 55, 56 of the apparatus 10' can be  
13 varied to control the range of motion (i.e., inclination angle and level of effort) of the  
14 user's body during use as shown in Figs. 8A - 8C. Fig. 8A illustrates the configuration  
15 with the back wedge section 16' fully inflated, which provides the easiest (least) level of  
16 effort. Fig. 8B illustrates the configuration with the back wedge section 16' partially  
17 inflated, which provides an intermediate level of effort. Fig. 8C illustrates the  
18 configuration with the back wedge section 16' removed, which provides the hardest (most  
19 advanced) level of effort. Such inclination angle control can be used to avoid lower back  
20 strain as described above.

21  
22 In addition, the inflation level of the air chamber 54 of the wedge section 51 can  
23 also be used to control position of the user can control his/her leg position, which enables



1 the user to adjust the position of the pelvis and lower back as desired. Finally, the  
2 inflatable lumbar support chamber 55 provides a soft intermediary between the floor and  
3 the upper buttocks/lower back of the user. It also provides an impact cushion (air  
4 cushion) to smooth out the transition from rocking back to rocking forward, which avoids  
5 the jerkiness of the sit-up which caused injuries in the prior art. It also enables adjustable  
6 positioning of the lower back and aids to isolate the muscle groups in the stomach during  
7 exercise (by eliminating assistance from the hip-flexor muscles).

8  
9       There have been described and illustrated herein several embodiments of an  
10 abdominal exercise apparatus and method of using such apparatus. While particular  
11 embodiments of the invention have been described, it is not intended that the invention be  
12 limited thereto, as it is intended that the invention be as broad in scope as the art will  
13 allow and that the specification be read likewise. Thus, while particular hand gripping  
14 mechanisms have been disclosed, it will be appreciated that other hand gripping  
15 mechanisms such as straps or support bars can be used as well. Alternatively, the grips  
16 can be molded holes into the support structure 20. In addition, while particular types of  
17 air chambers have been disclosed, it will be understood that other inflatable air chamber  
18 types can be used. For example, the air chambers could have structural support members  
19 therein. Moreover, the abdominal exercise apparatus described herein can be  
20 manufactured with different sizes, with different shapes and with different materials.  
21 Preferably, the apparatus can be folded and compressed such that it fits into a small box  
22 or a suitcase for traveling. It will therefore be appreciated by those skilled in the art that

- 1 yet other modifications could be made to the provided invention without deviating from
- 2 its spirit and scope as claimed.
- 3